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The structural characteristics of online sports betting: a scoping review of current product features and utility patents as indicators of potential future developments

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ABSTRACT

'Structural characteristics' are gambling product design features which contribute to the amount of time or money that gamblers spend using them, such as the short pay-out intervals of electronic gaming machines (EGMs). However, it is important to also understand the structural characteristics of current online sports betting products, and how these products may continue to evolve *via* a forward-looking analysis of utility patents, given the increasing international popularity of this gambling mode. A scoping review of the emergent structural characteristics associated with online sports betting was conducted upon the literature (2015–2022), and of sports betting utility patents. A total of 26 literature records and 8 utility patents were included. Results indicated that online sports betting is instantly accessible, provides rapid and continuous betting opportunities, and offers user-interactivity *via* features such as 'cash-out' and the ability to instantly deposit funds. Additionally, the online sports betting market has expanded into adjacent industries such as esports. The included utility patents suggest that online sports betting may evolve by incorporating peer-to-peer competitive elements, augmented reality, and highly specific statistics/notifications. Overall, the online environment has transformed sports betting into a faster and more harmful gambling mode that provides a diverse range of features and betting opportunities. It is important that this area of research develops in order to encourage appropriate policy and the more ethical redesign of online sports betting products.

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Introduction

Sports betting is a form of gambling that has seen a significant rise in profitability on an international level (Etuk et al. 2022). Since 2015, the global market value of sports betting has increased by a total of 13% to 243 billion (US) dollars in 2023 (Ibisworld 2023). Changes in rules and policies relating to sports betting across many jurisdictions have helped facilitate the expansion of this market (Etuk et al. 2022). Sports betting has been prevalent in the UK and Australia since the introduction of the 2005 Gambling Act and 2001 Interactive Gambling Act respectively (Pradier 2019; Banks and Waters 2022). However in 2018, the United States Supreme Court removed the federal prohibition of sports betting, which allowed states to legalize and oversee sports betting as they see fit. Subsequently, sports betting has been legalized across 36 states as of March 2023 (Waters 2023). Similar changes have occurred in Canada whereby the federal ban on sports betting was lifted in 2021. This allowed individual provinces to tax and control sports betting with 7/10 provinces having legalized this gambling mode as of January 2023 (Vieira et al. 2023). The expansion of sports

betting is expected to grow significantly in Asia and Africa, as seen in countries like India, Taiwan, and Malawi. This growth is due to the opening up and increasing availability of sports betting (Bunn et al. 2020; Das 2021; Etuk et al. 2022; Hazarika and Ray 2023).

In addition to policy changes, the increased popularity of sports betting has been facilitated by the transformative shift from venue-based sports betting to the online environment (*via* websites and apps). This shift provides instant accessibility to sports betting platforms whereby consumers are no longer constrained by the opening times of bookmakers and can place a variety of different wagers at any given time (Hing et al. 2022). Even in jurisdictions where sports betting is illegal, consumers can easily gain access to this gambling mode through virtual private networks (VPNs) or proxy servers (Griffiths 2019). There are numerous implications associated with the rise and digitization of sports betting. Firstly, the pervasiveness of this gambling mode has led to increasing concerns about the normalization of sports betting, especially amongst young or vulnerable consumers (McGee 2020; Sharman 2022). This issue is compounded by

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the aggressive marketing of sports betting products across television, *via* social media, and within sports (Newall et al. 2019; Torrance et al. 2021). In addition, there are more contemporary advancements in the commercial promotion of sports betting such as affiliate and content marketing. Affiliate marketing is an emergent form of incentivized advertising whereby third parties (such as ‘tipsters’ or social media influencers) are financially compensated for directing consumers toward a sports betting product or brand (Houghton and Moss 2022). Content marketing involves the subtle promotion of sports betting interwoven into seemingly innocuous content such as memes or video blogs (Rossi and Nairn 2022). Alongside these pervasive marketing strategies, the evolution and digitization of sports betting has also encouraged new product design features that warrant empirical study into their potentially harmful effects (Parke and Parke 2019; Hing et al. 2022).

The design features of online products such as social networking, online gaming, and gambling have garnered academic attention recently (Newall 2019; Flayelle et al. 2023; Hing et al. 2023). There is perhaps a longer tradition of similar research on land-based electronic gaming machines (EGMs), under the term ‘structural characteristics’ as reference to design features that encourage gamblers to spend either more time or money on gambling (Schüll 2012; Livingstone 2017). The primary structural characteristics of EGMs involve rapid and continuous play that can lead to immersion, short payout intervals, multiplier potential (e.g. *via* progressive jackpots), and near-miss events (Griffiths 1993; Parke and Griffiths 2007; Harris and Griffiths 2018). It should be acknowledged that compared to online sports bets, there are not many similarities between ‘traditional’ or ‘land-based’ sports bets and EGMs. ‘Traditional’ sports bets are subject to longer timeframes and are typically applied to singular (rather than multiple) events such as the winning team. However, online sports betting products have diversified and are increasingly incorporating characteristics that are similar to EGMs (Newall et al. 2021). One such example involves online sports betting products incorporating features such as in-play or ‘micro’ bets. These types of bets can be placed after sporting events have started and are often centered around specific and short-term elements within the game (Gainsbury et al. 2020). Subsequently, in-play and micro sports bets are associated with shorter pay-out intervals in a similar fashion to EGMs (Newall et al. 2021).

There appears to be few studies that have provided a review of the structural characteristics of online sports betting products. A review of ‘in-play’ sports betting features was conducted upon the literature and sports betting platforms by Killick and Griffiths (2019). Although warranted, this review focused solely on specific aspects of in-play betting rather than online sports betting overall. Similarly, Flayelle et al. (2023) provide a taxonomy of technological design features of online gaming, gambling, social networking, and cyber-sexual activities that promote potentially addictive behaviors. The authors focus broadly upon gambling-related mechanisms and the decision architecture of gambling websites. In combination, these studies provide insight regarding some of the features associated with online

sports betting, but a more scoping investigation of online sports betting structural characteristics is warranted. Addressing this gap in the literature can encourage the more ethical redesign of online sports betting products as has occurred in relation to other gambling products previously (Cassidy et al. 2014; Ginley et al. 2017). For example, EGMs in the UK have previously undergone harm-reductive changes (such as reduced stake limits) as a result of the empirical literature that examined EGM structural characteristics (Griffiths 1993; Parke and Griffiths 2007; Harris and Griffiths 2018). It is therefore envisaged that a scoping review focusing upon the structural characteristics of online sports betting can contribute to similar harm-reductive change that reduces the speed and ease of this gambling mode. This contribution is pertinent to jurisdictions in which online sports betting has long been permitted (such as the UK) alongside those that have recently permitted or are set to permit this gambling mode in the future.

It appears that currently, the literature in this area may struggle to keep pace with the rapid expansion of the sports betting sphere. Internal information concerning the ever-changing design of online sports betting products is not often made available to the public. Researchers are therefore often tasked with empirically investigating these products after they have been commercially available for some time (Killick and Griffiths 2021). This usually leads to a disparity between the emergence of sports betting products and the associated empirical research that must undergo the necessary (yet often time-consuming) steps of the publication process (Powell 2016). Consequently, more forward-looking methodologies are warranted that can provide insight regarding the potential evolution of online sports betting products. One such example involves investigating sports betting utility patents. A utility patent is an exclusive right that is granted to an invented product or process that provides legal protection against the using, selling, or distribution of the patented invention by other parties. Utility patents are typically granted prior to the invention being made publicly or commercially available. A review of utility patents can therefore provide insight into how specific products may develop in the near future. This methodology was previously utilized by King et al. (2019) in relation to gambling-like microtransactions and ‘loot boxes’ in video games. As a result of using this methodology, King et al. (2019) contributed to a prescient understanding of microtransaction and loot box features during a time in which the empirical literature on this topic was scant. Utilizing this same approach in relation to online sports betting patents can provide similar insight. Therefore, this review aimed to:

1. Provide a scoping review of existing online sports betting structural characteristics based upon the emergent academic literature.
2. Provide an estimation of the potential ways in which these structural characteristics may evolve according to available utility patents.

Methodology

The present review followed best practices for scoping reviews (Arksey and O'Malley, 2005; Levac et al. 2010; Tricco et al. 2018). Scoping reviews are similar to systematic reviews but do not necessarily involve academic or empirical research exclusively, nor is it a requirement that they comprehensively assess the quality of records found. The main purpose of scoping reviews is to provide a clear overview in relation to relatively broad topics in which there is a paucity of cohesive literature (Munn et al. 2018). The review protocol was preregistered *via* the Open Science Framework (OSF) before the search strategy commenced (preregistration URL: https://osf.io/fx7rj?view_only=7e1d573b72c44d6ebc6abfc573e314a1).

Information sources and search strategy

The electronic databases Scopus, PsycINFO, and PubMed were utilized during the search strategy (conducted November 2022) to identify eligible literature-records published between 2015 and 2022. General searches were also conducted *via* Google Scholar to identify and retrieve any further records. The following terms were used within the search strategy in conjunction with Boolean operators (AND/OR); *sport**, *bet**, *gambl**, *in-play*, *esport**, *online*, *product**, *structur**, *feature**, *characteristic**, *tech**, *harm**. Structural characteristics were defined as design features, mechanics, or wider elements of online sports betting products. Google Patents contains 120 million utility patents from over 100 patent offices, and was searched using the terms '*sports betting*', '*feature**', '*product**' and '*characteristic**' in conjunction with Boolean operators (AND/OR). The search criteria also involved 'granted' patents dated between 2015–2022 and patents presented in the English language. See Figure 1 for the search strategy flow diagram.

Study selection and data extraction

Eligible literature-records needed to (1) be published in the English language; (2) be published between 2015 and 2022; (3) relate solely (or in-part) to specific structural characteristics of online sports betting (including esports), (4) involve any population of sports bettors (if applicable); (5) utilize any method of measuring gambling harm (if applicable). Utility patents were eligible for inclusion if they: (1) were issued between 2015 and 2022; (2) were issued in the English language; (3) had been 'granted' (rather than being at the application stage); (4) related to the structural characteristics of online sports betting; specifically, the design or development of products/technologies that are not in widespread use.

Following the retrieval of literature-records from the online databases ($n = 834$) and Google Scholar ($n = 19$), duplicates were removed using Mendeley reference management software. The remaining record titles and abstracts ($n = 402$) were screened by JT in line with the eligibility criteria of the current review. Subsequently, full-text screening of the remaining literature-records ($n = 43$) was conducted by three reviewers (JT, MOH, and JC). A final set of 26 literature-records were included in the review. This same

process was carried out by JT and MOH in relation to the patents in which 437 patent-records were identified. The descriptions of these patents were screened against the objectives of the current review before final inclusion ($n = 8$). The data relating to the characteristics of the included literature and patent-records were collated and tabulated (see Tables 1 and 2 respectively). Narrative synthesis was then conducted between all coauthors in order to thematically summarize the findings (Popay et al. 2006).

Results

Online sports betting structural characteristics

Twenty-six literature records were included in the scoping review: 10 quantitative studies, 8 qualitative studies, 2 mixed-methods studies, 2 literature reviews, 1 scoping study, and 3 discussion papers (see Table 1 for more details). These literature records were categorized across four overarching themes as a result of narrative synthesis: (1) Instant access; (2) Continuous betting opportunities; (3) Customizability; and (4) Market convergence.

Instant access

The instant accessibility and availability of online sports betting products were outlined across ten of the included literature records. Due to the transformative shift from venue-based sports betting to the online environment, sports bettors are now provided with the opportunity to bet anywhere at any given time within numerous jurisdictions (Parke and Parke 2019; Hing et al. 2022). This structural characteristic is often described as a preferred feature of online sports betting by both male and female sports bettors that is grounded in a partiality for convenience, comfort, anonymity, and a calmer environment compared to venue-based sports betting (McCarthy et al. 2018; Killick and Griffiths 2021; Hing et al. 2022). Similar preferences have also been expressed by esports bettors although there is a larger emphasis placed upon the availability of wagering options across websites and apps (rather than instant access) given that esports betting has almost exclusively been accessible online since its conception (Gainsbury et al. 2017).

Sports betting on smartphones may amplify risk *via* streamlined and easy to navigate apps that provide bettors with convenient access to multiple operators, betting-related information sources, and 'spur of the moment' betting opportunities (Hing et al. 2022). For example, wagers *via* smartphones can be placed effortlessly and may therefore stimulate bettors to wager more than they usually would or place wagers in a less cautious or more spontaneous manner (Deans et al. 2016; Hing et al. 2022). Maladaptive or disordered sports bettors have expressed how instantaneous access to online sports betting allows for the opportunity to place wagers in a matter of seconds whilst in a private environment that is often free from the judgment of others (Hing et al. 2022). Sports betting *via* smartphones is especially frequent amongst disordered sports bettors (Lopez-Gonzalez et al. 2019). The awareness that online sports betting is

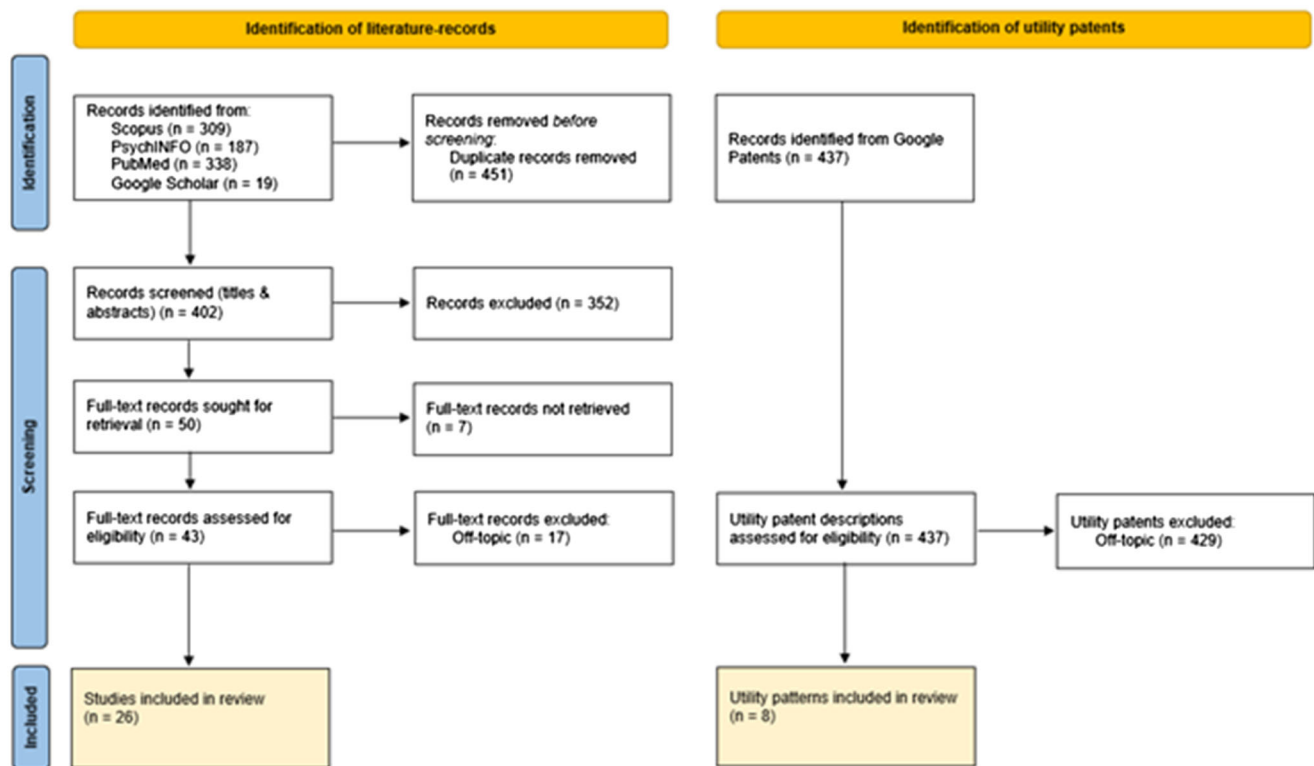


Figure 1. Search strategy and study selection PRISMA flow diagram.

constantly available ‘*just a few clicks away*’ (Hing et al. 2022) may also operate as an environmental cue amongst disordered gamblers that triggers a return to multiple online sports betting sessions throughout the day (Lopez-Gonzalez et al. 2019; Parke and Parke 2019).

Continuous betting opportunities

The rapid and continuous characteristics of online sports betting products were identified across twelve of the included literature records. Sports bets are not just easier to access, but are also available continuously on short pay-out intervals, similar to EGMs (Newall et al. 2021).

In-play bets are placed while a sporting event is happening and is therefore dynamic since the odds can change rapidly based on how the event unfolds. For example, if a favorite team is unexpectedly losing in the early stages of a match, the odds of the longshot team winning may increase, potentially making them a more favorable betting option. In-play betting has therefore been associated with more impulsive and riskier wagers (Hing et al. 2018). Similarly, several studies have demonstrated the positive relationship between in-play betting engagement and higher problem gambling severity (Killick and Griffiths 2019; Lopez-Gonzalez et al. 2019; Parke and Parke 2019; Gainsbury et al. 2020; Lopez-Gonzalez et al. 2020a). Bettors report preferring in-play bets due to an increased sense of excitement, a heightened ‘intensity’ when in-play betting, and the ability to utilize game/match-related information to support in-play betting decisions (Killick and Griffiths 2021; Torrance et al. 2022).

‘Microbetting’ refers to in-play bets placed on the shortest intervals in a sporting event possible, such as the next serve in tennis (Hing et al. 2018). Therefore, microbetting significantly increases the outcome frequency of online sports betting to levels that have been likened to EGMs (Newall et al. 2021). Microbetting frequency is related to disordered gambling severity and impulsivity (Russell et al. 2019). Overall (although to varying degrees), the literature indicates that in-play betting and microbetting are both facilitative of increased speeds of play and outcome frequencies within online sports betting alongside being associated with maladaptive or disordered gambling. Therefore, numerous authors have proposed introducing reductions in the continuous availability of in-play and microbets (Killick and Griffiths 2019; Parke and Parke 2019; Russell et al. 2019).

Customizability

The customizable nature of online sports betting products and structural characteristics that provide user-product interactivity were outlined across 15 of the included literature records. Specifically, the topics that were covered in relation to this narrative theme included custom sports bets, ‘cash-out’ features that are commonly available to online sports bettors, and the functions relating to financial transactions within the online sports betting environment.

Custom sports bets involve unique wagers that are created and tailored to the preferences of consumers that provide an enhanced amount of perceived control over betting decisions compared to traditional wagers offered by bookmakers (Lopez-Gonzalez et al. 2019; Newall et al. 2021). These unique bets involve combining individual events

Table 1. Characteristics table of included literature.

Author(s)	Date	Setting ^a	Study design	Type(s) of sports betting included	Aims and objectives	Structural characteristic(s) identified/discussed
Deans, Thomas, Daube & Derevensky	2016	Australia	Qualitative (constructivist grounded theory) interviews of 50 young men	Online sports betting	To investigate: (1) the distinct factors that encourage young men to consume gambling products in different gambling environments; (2) how these factors contribute to risky gambling behaviors; (3) if gambling co-exists with other forms of risky behaviors in some environments?	Instant access and availability of sports betting products provided through mobile phone apps was discussed by participants
Gainsbury, Abarbanel & Blaszczynski	2017	Australia	Quantitative analysis of the demographics and gambling behaviors of esports gamblers ($n = 159$) and sports bettors ($n = 336$)	Esports betting and online sports betting	To describe the characteristics of Australian online esports gamblers as compared to those wagering on sports online	Both gambling modes were favored for their ease of use and accessibility. Esports gamblers favored no betting limits and sports bettors favored the wide range of payment methods available.
Gainsbury, Abarbanel & Blaszczynski	2020	Australia	Quantitative analysis of 501 gamblers in relation to their betting behaviors and self-reported gambling-harm (PGSI)	Online sports betting – in-play betting	To understand the association between online in-play betting and gambling problems	The continuous nature of in-play betting alongside in-play bettors being three times more likely to experience gambling-related harm compared no traditional sports bettors
Gordon, Gurrieri & Chapman	2015	Australia	Qualitative (interpretivist) interviews of 50 sports bettors	Online sports betting	To address the following research question: How do consumers interpret, navigate and participate in sports betting consumption communities in Australia?	Products catering to the perceived skills and knowledge of sports bettors. ‘Special bets’ sometimes drew participants in based on this perceived knowledge
Greer, Rockloff, Browne, Hing & King	2019	Australia	Literature review ($n = 10$) on the history of esports betting and skin gambling	Esports betting and skin gambling	To provide a historical overview of esports betting and skin gambling. Including an informational summary on the products, ongoing developments, and current knowledge.	Esports betting allowing cryptocurrency payments, Skin gambling involving in-game items that have monetary value and easily accessed by children.
Hing, Li, Vitartas & Russell1	2018	Australia	Quantitative analysis of the factors that predict impulse bets of Australian sports bettors ($n = 1816$)	Online sports betting – in-play and microbets	To identify the behavioral, psychological, and socio-demographic predictors of impulse sports betting.	In-play betting and microbets were common. More impulsive sports bettors were characterized as having higher trait impulsiveness, higher problem gambling severity, more frequent sports betting and a shorter history of sports betting. They favored betting on in-match contingencies instead of overall match outcomes
Hing, Lole, Russell, Rockloff, King, Browne, Newall & Greer	2022	Australia	Quantitative analysis of the characteristics and behaviors of Australian adolescents ($n = 1667$) aged 12–17	Esports betting and skin gambling	To assess the demographics, behaviors, and problem gambling severity of adolescents who engage with esports betting and skin gambling	Esports betting using skins appears to pose risks for young people and is easily accessible through unlicensed operators.
Hing, Thorne, Russell, Newall, Lole, Rockloff, Browne, Greer, & Tulloch	2022	Australia	Qualitative grounded theory analysis involving gamblers ($n = 33$) aged 18–29	Online sports betting and esports betting	To explore how the use of smartphones can influence sports betting by young adults, compared to using computers and land-based betting facilities	Instant access and availability of sports betting products provided through mobile phone apps, online sports betting being particularly speedy, the ease of financial transactions provided by digital infrastructure

(continued)

Table 1. Continued.

Author(s)	Date	Setting ^a	Study design	Type(s) of sports betting included	Aims and objectives	Structural characteristic(s) identified/discussed
Hing, Smith, Rockloff, Thorne, Russell, Dowling & Breen	2022	Australia	Qualitative interview study using thematic analysis involving gamblers ($n = 30$) aged 32–87 years old	Online sports betting	To explore the following research questions (1) What key changes in online gambling have online gamblers observed over the past decade? (2) How have these changes influenced the online gambling experiences and behaviors reported by treatment-seeking and non-treatment-seeking gamblers?	Increased accessibility, ease of use and speed, ease of financial transactions, and a wide variety of betting types (such a multi-bets)
Killick & Griffiths	2019	UK	Scoping study of in-play betting involving a literature review and examination of online gambling websites ($n = 338$)	Online sports betting – in-play betting	To identify what (1) has been published on the topic, (2) empirical studies have been carried out, and (3) in-play features are currently available to online sports gamblers <i>via</i> an examination of the world's leading sports betting sites	In-play sports betting has the potential to be more harmful than other ways of gambling because of the associated structural characteristics e.g. cash out.
Killick & Griffiths	2021	UK	Qualitative interview study using thematic analysis involving sports bettors ($n = 19$) aged 21–32 years old	Online sports betting – in-play betting	To explore participants' opinions and attitudes to in-play sports betting, and the 'cash out' feature within online sports betting.	Ease of placing in-play bets anywhere using a smart phone, ability to utilize skills and knowledge, the ability to use the cash-out feature
Lopez-Gonzalez & Griffiths	2018	UK/Spain	Exploratory discussion paper	Online sports betting and Esports betting	To explore the horizontal integration and collision of adjacent industry sectors into the online sports betting market, regarding sport as content or as a product, sports fans and bettors as consumers, and considering each integration as a business opportunity	The market expansion of online sports betting has resulted in its convergence with Esports, leading to esports betting
Lopez-Gonzalez, Estevez & Griffiths	2019	Spain	Quantitative analysis of gamblers' ($n = 659$) responses to a survey that assessed their use of online sports betting structural features and problem gambling severity	Online sports betting – in-play betting	To identify the influence of new online betting structural characteristics and examine if problem gambling severity varied across such new features.	In-play betting provides instantaneous and rapid betting opportunities, the cash out feature and sports betting using mobile phone was associated with higher problem gambling scores
Lopez-Gonzalez, Griffiths & Estevez	2020	Spain	Quantitative analysis of survey responses from in-play bettors ($n = 659$)	Online sports betting – in-play betting	To empirically examine the interaction and association between live sports watching and live sports betting, and the potential negative consequences from a problem gambling perspective.	In-play was associated with higher problem gambling compared to those who did not engage with in-play betting due to the instantaneous and impulse-driven nature of this gambling mode
Lopez-Gonzalez, Griffiths & Estevez	2020	Spain	Qualitative focus group study involving treatment-seeking sports bettors ($n = 43$)	Online sports betting – in-play betting	To explore how sports bettors undergoing treatment for gambling disorder navigate the balance of knowledge/skills versus chance inherent to sports betting products.	The structural characteristics of online sports betting were reported to facilitate the maintenance of certain cognitive distortions. Namely, perceptions toward the advantageous effects of sports-related skills and knowledge when sports betting.
Lopez-Gonzalez, Griffiths & Murcia	2021	UK/Spain	Conceptual discussion paper	Online sports betting	To discuss the harm-related repercussions of the skill versus chance balance in	Sports betting products are symbolically constructed around the use of skills

(continued)

Table 1. Continued.

Author(s)	Date	Setting ^a	Study design	Type(s) of sports betting included	Aims and objectives	Structural characteristic(s) identified/discussed
Lopez-Gonzalez, Murcia & Griffiths	2019	UK/Spain	Conceptual discussion paper and case study	Online sports betting – in-play betting	the cognitions of sports bettors, generalizing the findings to the interaction between gaming and gambling. To discuss the role of personalization and customization of sports betting products relation to responsible gambling issues	and knowledge that impact risk-perception amongst sports bettors. Custom sports betting products are underpinned by the notion that they increase the sense of control bettors have when they gamble. However, it is more accurate to categorize these products as pseudo-skills based considering they are designed and constructed with house-edge that is not explicitly obvious. This design is likely to facilitate illusions of control amongst sports bettors.
McCarthy, Thomas, Randle, Bestman, Pitt, Cowlshaw & Daube	2018	Australia	A mixed-methods survey of Australian female gamblers (<i>n</i> = 509) investigating their gambling behaviors, motivations and perceptions.	Online sports betting	To address four research questions: (1) How does gambling frequency vary by age and gambling risk status? (2) How do forms of gambling that women are participating in vary by age and gambling risk status? (3) Do women's reasons for preferring some forms of gambling vary by age and gambling risk status? (4) To what extent do women's perceptions of harm associated with gambling products vary by age and gambling risk status?	For those women who preferred sports betting, the predominant theme was associated with how easy it was to access sports betting products
Newall, Cassidy, Walasek, Ludvig & Meyer	2020	UK	Quantitative analysis of survey responses from UK sports and horse-race bettors (<i>n</i> = 789) investigating custom-sports bet (CSB) usage, problem gambling severity, gambling harm, gambling cognitions, and gambling consumption	Online sports betting – custom sports bets	To address the following research questions: (1) Are people identified as 'problem gamblers' by the PGSI screen more or less likely to use CSB products than other sports bettors? (2) Are illusions of control biases more prevalent among CSB users compared to sports bettors who do not use CSBs? (3) Do sports bettors who use CSB products experience more gambling-related harm than sports bettors who do not use CSBs? (4) How does the engagement with CSB products vary across sports bettors' levels of gambling consumption?	CSB usage was most strongly associated with gambling consumption. Furthermore, measures of illusions of control were significantly positively correlated with whether participants had ever used a CSB before (but not whether participants had engaged with CSB in the past year).
Newall, Walasek, Kiesel, Ludvig & Meyer	2021	UK/Australia/Germany	Two-study quantitative analysis investigating request-a-bets <i>via</i> Twitter data alongside a survey (<i>n</i> = 55) of self-reported usage of such bets	Online sports betting – custom sports bets	To take advantage of the public nature of Twitter data to investigate patterns in bettor preference and bookmaker profitability across a large sample of soccer bet requests	Requested bets yielded a high bookmaker profit margin of 43.7% for short odds bets (roughly eight times higher than current margins in conventional soccer bets), which increased to 74.6% for bets at longer odds. In addition, 92.7% of surveyed Twitter users reported placing at least one bet <i>via</i> request-a-bet services.

(continued)

Table 1. Continued.

Author(s)	Date	Setting ^a	Study design	Type(s) of sports betting included	Aims and objectives	Structural characteristic(s) identified/discussed
Newall, Russell & Hing	2021	Australia	Comparative and narrative literature review of EGM and fixed-odds sports betting structural features	Online sports betting – fixed odds betting	To review previous research on contemporary fixed-odds sports betting products, and to identify whether structural characteristics from the EGM literature are also relevant to sports betting.	There are numerous sports betting structural characteristics that are also present in EGMs. These include, shorter pay-out intervals (<i>via</i> in-play betting/multi-bets), multiplier potential <i>via</i> features such as accumulators, high bettor involvement, the utilization of skill, and near miss events.
Nyemcsok, Pitt, Kremer & Thomas	2022	Australia	Critical qualitative inquiry using in-depth interviews of young male sports bettors (<i>n</i> = 16). The interviews focused on perceptions toward the risks of sports betting products	Online sports betting	To explore the following research questions; explored: (1) What factors influence how young men conceptualize and reflect upon the risks associated sport betting? (2) Do perceptions of knowledge, skill, control contribute to young men's motivations to gamble? (3) Do the findings highlight specific areas for intervention associated with young men's sports betting and risk conceptualisations	The utilization of sports-related skills and knowledge was a common theme expressed by the participants in which this was perceived to lower the risk of bets placed. This perception led some participants to favor multibets over more simplistic bets.
Nyemcsok, Pitt, Kremer & Thomas	2022	Australia	Critical qualitative inquiry using in-depth interviews of young male sports bettors (<i>n</i> = 16). The interviews focused on perceptions toward sports betting harm-reduction and prevention strategies	Online sports betting	To explore the following two research questions: (1) What strategies do young men indicate would be helpful in preventing and reducing harm associated with sports betting? (2) How do young men believe they could be engaged with, and contribute to, the development of these strategies?	A common sentiment expressed by numerous participants related to the instantaneous nature of sports betting provided by its accessibility
Parke & Parke	2019	UK	Systematic grounded theory utilizing behavioral data and in-depth interviews of sports bettors (<i>n</i> = 19).	Online sports betting	To identify and explain key behavioral processes related to patterns of problematic online sports betting and will provide recommendations for mitigating and moderating gambling-related harm associated with this gambling format.	A behavioral loop facilitated by new structural features of modern online sports betting such as live betting, cash out, micro-event betting and instant depositing. In addition, participants indicated that the immediate accessibility and the ubiquity of online sports betting marketing made it challenging to control sports betting involvement
Russel, Hing, Browne, Li & Vitartas	2018	Australia	A quantitative analysis of survey responses from sports bettors (<i>n</i> = 1813) in relation to their demographics, self-reported gambling harm, and microbet usage	Online sports betting - microbets	To inform evidence-based policy and practice by examining the association between micro event betting and problem gambling. To determine the demographic, behavioral and psychological characteristics of micro event bettors, and of those who place more of their bets on micro events.	More highly engaged bettors, including those with gambling problems, are more likely to bet on micro events and place more of their bets on micro events. Of those who bet on micro events, 78% met criteria for problem gambling

(continued)

Table 1. Continued.

Author(s)	Date	Setting ^a	Study design	Type(s) of sports betting included	Aims and objectives	Structural characteristic(s) identified/discussed
Torrance, Roderique-Davies, Greville, O'Hanrahan, Davies, Sabolova & John	2022	UK	Quantitative cluster analysis based on sports bettors ($n = 225$) tilting occurrence and in-play ($n = 165$) product preferences	Online sports betting – in-play betting	Aimed to investigate; (1) How many classifications of sports bettors exist in relation to their reported tilting and awareness of this phenomenon? (2) How do these classifications of sports bettors differ in relation to gambling severity, gambling frequency, impulsivity, type of sport bettor (in-play/conventional), and perceived gambling skill? (3) What are the product preferences of the in-play bettors between the classifications?	Amongst three groups of in-play bettors ($n = 165$), the group that reported the highest cognitive and emotional dysregulation reported the significantly highest use frequency of the embedded livestream feature, stats board, instant deposit feature. The perceived importance of the instant deposit feature was also significantly higher amongst this group.

Note. ^aWhere the setting was not explicitly stated, the jurisdiction(s) of author affiliation was listed.

together and can either be formulated on operator websites or by requesting the associated odds *via* Twitter (Killick and Griffiths 2019; Newall et al. 2021). Products such as custom sports bets may contribute to the wider perception amongst sports bettors that they can advantageously utilize their sports-related skills and knowledge whilst gambling (Gordon et al. 2015; Lopez-Gonzalez et al. 2020b; 2021; Nyemcsok et al. 2022). However, it has been suggested that these types of online sports bets can be more accurately categorized as '*pseudo skills-based*' (Lopez-Gonzalez et al. 2019), given that their abnormally high bookmaker profit margins make long-run wins from customized sports bets an unlikely possibility for bettors (Newall et al. 2020; 2021). Correspondingly, sports bettors' likelihood of choosing to customize their bets has been associated with higher levels of the cognitive bias known as the illusion of control (Newall et al. 2020; 2021).

Cash-out is a popular online sports betting feature that allows consumers to settle their bet before the event has concluded for a guaranteed pay-out that may be more or less than the original stake based on the current odds (Killick and Griffiths 2019; Lopez-Gonzalez et al. 2019). The use of this feature amongst online sports bettors is primarily underpinned by a motivation to minimize potential losses (Killick and Griffiths 2021). Use of cash-out features is also associated with disordered gambling (Lopez-Gonzalez et al. 2019), potentially because it can also contribute to an illusion of control. An underappreciated aspect of cash-out is that the service is not free, as it has an implied profit margin for the bookmaker which can be especially high when large amounts of money are at risk (Newall et al. 2021). Cash-out is another feature that can shorten the pay-out interval in sports betting, as it allows a bet to be realized early and funds potentially bet elsewhere (Parke and Parke 2019).

Research also highlighted the ease of instantly depositing funds into an online sports betting account alongside the implications associated with withdrawing funds/winnings (Hing et al. 2022; 2022). Although the instant deposit feature is available across almost all online gambling modes, sports bettors have expressed a preference for this feature and deem it be an important component of the online sports

betting experience (Hing et al. 2022; Torrance et al. 2022). However, sports bettors have also reported that this feature may facilitate the perception that digital currency is easier to spend and has less perceived value compared to physical cash (Hing et al. 2022). Treatment seeking and disordered sports bettors have also reported the difficulties experienced regarding the delays imposed upon the withdrawal of winnings that usually take a number of days (despite depositing being instantaneous). This issue is reportedly compounded by the ability to re-stake winnings before the withdrawal delay period had concluded (Parke and Parke 2019; Hing et al. 2022), an exploitative practice that is now banned in the UK (Newall and Rockloff 2022).

Market convergence

The convergence of online sports betting with adjacent products including esports betting and skin gambling was outlined across four of the included literature records. Esports betting is a rapidly growing market in which wagers are placed on the outcome or specific components of competitive video gaming events or tournaments in a similar fashion to online sports betting (Hing et al. 2022). Skin gambling is often encompassed by esports betting where cosmetic items that alter the appearance of video game weapons, characters, or other in-game objects are used as currency to place bets (Greer et al. 2019).

Due to the large audiences that esports events garner, the vast majority of leading sports betting operators now offer esports betting opportunities to consumers (Lopez-Gonzalez and Griffiths 2018). There is a general paucity of empirical literature that focuses upon the specific structural characteristics of this emergent gambling mode. However, esports bettors have previously expressed that they use unlicensed gambling sites to a significantly higher degree compared to online sports bettors (Gainsbury et al. 2017). This is primarily due to a preference toward the amount of esports betting products available on unlicensed websites alongside the ease of account creation and not being required to prove one's age/identity (Gainsbury et al. 2017).

Table 2. Utility patents characteristics table.

Patent number/ registration ID	Patent title	Inventor	Issue date	Patent office	Summary	Classification
US10198910B2	Tournament style in-play sports betting with real time leaderboard tracking	Theodoros Theodosopoulos	2019	United States Patent and Trademark Office	A platform that is configured to identify a request by a sports bettor to join a tournament with a predefined entry fee and compete for rewards derived as a function of predefined entry fees by a wager pool of players betting on the same tournament. An integrated leaderboard automatically calculates the winnings of the wager pool of players and displays, in real time fashion, the current leaders, in terms of winnings, during the tournament	Competition or interaction between sports bettors
DE102017213009A1	Method for simulating ranking lists in sports betting	Anmelder Gleich	2019	German Patent and Trademark Office	The invention relates to methods for simulating ranking lists in sports betting, especially those with constant game round budgets, as well as the creation of such ranking lists. It's about websites that allow users - to bet on sports events and to see and track their success or failure in a ranking.	Competition or interaction between sports bettors
US11087596B2	Gaming systems, devices, and methods for competitive real-time sports wagering	Dwayne Nelson and Cameron Filipour	2021	United States Patent and Trademark Office	Systems and methods that provide real-time head-to-head sports wagering between players of gaming devices. The players can exchange communications between an interface of their gaming devices about potential wagers, existing wagers, or past wagers.	Competition or interaction between sports bettors
US10706661B2	Augmented reality sports betting and augmented reality	David Froy	2020	United States Patent and Trademark Office	A wearable device comprising a wireless communications interface, an augmented reality display, an input device, a processor coupled with a wireless communications interface. The processor can present, through the augmented reality display, a menu comprising a set of sports betting options related to a competitive event.	Augmented reality
WO2022066518A1	AR VR in-play wagering system	Casey Alexander Huke and Michael D'andrea	2022	World Intellectual Property Organization	A system for play-by-play wagering on a live sporting event through an augmented reality device. Users of a play-by-play wagering network can place wagers on the outcome of individual plays in a live sporting event that are displayed based on the players or elements of the live event that are in the point of view of the user's augmented reality device.	Augmented reality
US11037410B2	Method of allowing a player to wager via an augmented reality device on a real-world event displayed on a virtual video display that is	Eric M. Pilnock, Kenneth E. Irwin Jr, Michael T. Day, Michael Pilnock, and Fred W. Finnerty	2021	United States Patent and Trademark Office	Methods for allowing a plurality of players to wager on a plurality of real-world events being displayed on virtual video displays that are viewable by Augmented Reality (AR) devices, and monitor progress of the real-world events and status of	Augmented reality

(continued)

Table 2. Continued.

Patent number/ registration ID	Patent title	Inventor	Issue date	Patent office	Summary	Classification
	being viewed by the augmented reality device				wagers or votes on the real-world events using the AR devices. Each of the real-world events are represented by a respective virtual video feed that becomes displayed on the virtual video displays. The AR devices are pointed at the virtual video displays to identify the real-world event.	
WO2022104100A1	Method of notifying a user about placing an uncommon bet	John Cronin	2022	World Intellectual Property Organization	The application determines what a typical sports betting wager is. The application flags a new wager if it is uncommon based upon a wager database. The application notifies the user of the uncommon wager before the wager is placed.	Information and notifications
WO2022087082A1	Method of displaying sports news related to a placed wager	Casey Alexander Huke, John Cronin, Joseph W. Beyers and Michael D'andrea	2022	World Intellectual Property Organization	A method of displaying sports news relevant to at least one wager being considered by the user. For example, news about a particular player.	Information and notifications

Similarly, due to the easy access facilitated in-part by a lack of age verification, unlicensed esports betting websites that incorporate skin gambling may pose particular risks for young people (Greer et al. 2019; Hing et al. 2022). Early evidence indicates that esports betting and skin gambling are associated with a greater risk of gambling involvement which may also extend into traditional modes of gambling (Greer et al. 2019). Consequently, regulatory intervention has been recommended against unlicensed esports betting and skin gambling websites to reduce gambling-related harm amongst young or underage consumers (Greer et al. 2019; Hing et al. 2022).

Pathways of product evolution via utility patents

Eight utility patents were included within the current scoping review (see Table 2 for more details). These utility patents were registered across three patent offices that included The United States Patent and Trademark Office ($n=4$), The World Intellectual Property Organization ($n=3$), and The German Patent and Trademark Office ($n=1$). These patent records were categorized across three overarching themes as a result of narrative synthesis: (1) Competition or interaction between sports bettors, (2) Augmented reality, and (3) Information and notifications.

Competition or interaction between sports bettors

Currently, online sports betting primarily involves consumers placing bets against online bookmakers with little to no interaction with other bettors (betting exchanges are an exception to this, but these have been subject to less research interest overall). However, three utility patents were identified involving user-interface (UI) betting platforms in which users can communicate and engage with in-play betting in a

competitive nature with other users (Gleich 2019; Theodosopoulos 2019; Nelson and Filipour 2021). For example, Theodosopoulos (2019) refers to systems in which bettors pay an entry fee to join an online tournament-style sports betting platform. *via* the outcomes of their in-play bets placed on a particular sporting event, sports bettors compete against other bettors for rewards based upon the entry fees and the associated wager pool. Within this platform, a leaderboard or ranking system is displayed in order for bettors to track their position in the tournament. A similar sports betting leaderboard or ranking system comparable to those used in online poker and daily fantasy sports environments is also more generally outlined within the utility patent by Gleich (2019).

There is a similarly competitive format associated with Nelson and Filipour (2021) which refers to systems and devices by which sports bettors can compete head-to-head on predefined wagers associated with live sporting events. These wagers would be initiated by virtual invitations that are sent to the devices of other sports bettors who can accept, decline, or request to modify the wager. The bettors are then notified of the outcome with the successful bettor receiving the winnings.

Augmented reality

Augmented reality (AR) is defined by superimposed computer-generated imagery that is mapped onto users' view of the real-world. This composite view is often facilitated by equipment such as goggles but can also be achieved *via* the use of mobile phones to provide an AR overlay (Hugues et al. 2011).

Currently, consumers access and engage with online sports betting *via* the use of computer, mobile phone, or tablet screens that do not incorporate AR. However, the

current scoping review identified three utility patents that aim to assimilate these technologies into the online sports betting experience (Froy 2020; Pilnock et al. 2021; Huke and D'andrea 2022). For example, the utility patents by Froy (2020) and Huke and D'andrea (2022) refer to wearable devices (such as goggles) that incorporate an AR display allowing sports bettors to place real-time in-play wagers on live sporting events. Similarly, the utility patent by Pilnock et al. (2021) refers to systems by which a mobile phone can be pointed toward a video feed of a live sporting event and can provide an AR overlay on the mobile phone screen that presents sports bettors with the opportunity to place in-play wagers on that event.

Information and notifications

As previously discussed, online sports betting platforms often incorporate event-specific digital statistics boards of sporting events that sports bettors can utilize to inform their wagers. However, the current scoping review also identified two utility patents that relate to additional information and notifications delivered to sports bettors *via* an application (app) based upon their specific wagers (Cronin 2022; Huke et al. 2022). Cronin (2022) refers to an app that aims to reduce betting-relating errors or oversights that occur due to the fast-paced nature of in-play betting (e.g. mistakenly adding an extra zero to a wagering amount). In response to a particular sports betting wager, the app would receive information from a historical wager database and would notify the bettor that their bet was uncommon before it was placed. Huke et al. (2022) refers to a similar system in which bettors are notified of any associated sports news in relation to their particular in-play wager. For example, this could involve sporting news related to a particular player that the sports bettor may wish to consider in relation to their particular wagers.

Discussion

This scoping review focused on online sports betting structural characteristics and how these characteristics may continue to evolve *via* utility patents. In relation to the first research aim, the evidence here suggests that online sports betting is instantly accessible and is readily available to consumers on a 24/7 basis which may facilitate impulsive or spontaneous sports bets alongside increased engagement with sports betting. Moreover, the decision architecture associated with cash-out features and the ability to instantly deposit funds are furthermore associated with disordered sports betting and cognitive biases (Flayelle et al. 2023).

In combination, these online sports betting structural characteristics have been identified as key components within a harmful and continuous '*sports betting loop*' (Parke and Parke 2019). This loop begins with the awareness amongst bettors that online sports betting is instantly accessible. Once the online sports betting session has commenced, funds are often re-staked by utilizing features such as cash-out and losses are chased by instantly depositing funds or

reversing pending withdrawals until all funds are depleted (Parke and Parke 2019). Overall, the findings here suggest that online sports betting provides rapid, continuous, and customizable betting opportunities that significantly increase the speed of play and may encourage illusions of control amongst bettors. These features have been systematically compared to those incorporated within EGMs which are typically considered the prototypical examples of harmful gambling features (Yücel et al. 2018; Newall et al. 2021). Therefore, regulators and policymakers should consider reducing the speed and ease of online sports betting based upon the current findings.

Online sports betting is also converging with other emergent industries *via* esports betting and skin gambling (Gainsbury et al. 2017; Greer et al. 2019; Biggar et al. 2023). Due to being relatively new modes of gambling, there is an abundance of unlicensed websites that offer these gambling products in a way that is easily accessible to young and underage consumers (Greer et al. 2019; Hing et al. 2022). Future research should continue to monitor these emergent ways to gamble online (Hing et al. 2023), with one further example being cryptocurrency-based online gambling operators (Andrade et al. 2023; Hing et al. 2023).

The second research aim of this review focused on how online sports betting products may evolve *via* utility patents. Firstly, three patents were identified that aimed to introduce peer-to-peer competitive mechanics within the online sports betting environment. The prospective introduction of these mechanics highlights the potential for a new paradigm of maladaptive sports betting that is similar to daily fantasy sports play and poker (Palomäki et al. 2013; Dwyer et al. 2019). Competitive multiplayer is also a longstanding feature of EGMs (Pickering et al. 2020) and although it can sometimes operate as a protective factor by reducing isolation when gambling, it may also lead to increased gambling intensity (Delfabbro et al. 2020). Additionally, the online poker literature indicates that some players may place aggressive, strategically weak, and irrational bets (otherwise known as 'tilting') in response to losing money whilst competing against other players (Browne 1989; Moreau et al. 2020). Correspondingly, there is also emergent evidence that the phenomenon of 'tilting' is observable amongst sports bettors given the demographic and cognitive overlap with poker players (Torrance et al. 2022). Therefore, the introduction of peer-to-peer competitive elements into the online sports betting environment may exacerbate the facilitation of 'tilting'; especially as the associated patents provide the opportunity for competing sports bettors to communicate with (and potentially taunt) each other as is evident in online gaming (Tang and Fox 2016).

Three utility patents were also identified that aimed to assimilate augmented reality into the online sports betting environment. Augmented reality is associated with facilitating a sense of immersion due to integrating computer generated imagery into users' view of the real world (Kozinets 2023). EGMs have also been highlighted for their immersive nature and their tendency to invoke dark-flow states in which users become completely occupied or engrossed in a

maladaptive state whilst gambling (Kruger et al. 2022). Harmful immersion within an online sports betting context has also been highlighted recently and has been referred to as the ‘sports betting zone’ (Vieira et al. 2023). Consequently, the severity of harmful immersion within the online sports betting environment could increase following the implementation of these augmented reality patents (Froy 2020; Pilnock et al. 2021; Huke and D’andrea 2022). Two notification-based patents were also identified within the current review. Notification of sports-related news associated with specific bets may contribute to illusions of control as sports bettors might overestimate the advantages of such information in relation to the success probability of their wagers (Cantinotti et al. 2004). This is related to the potentially risky trend where lottery-like winning bets get reported in the news, such as the instance where a bettor won on Germany’s historic 7–1 defeat of Brazil in the 2014 soccer World Cup semifinal (Newall 2018).

The findings here demonstrate the usefulness of examining utility patents in relation to emergent gambling products. Specifically, utility patents are an effective evaluative tool that can provide insight into the evolution of gambling products before they are commercially implemented. This forward-looking methodology therefore reduces the disparity between the release of such products and the empirical literature that examines them. For example, the current review highlights the potential harms associated with online sports betting multiplayer, augmented reality, and personalized notifications during a time in which these features have not been employed within most online sports betting products. Consequently, future studies of gambling structural characteristics should seek to include utility patents where possible in order to better understand how such products may evolve.

Limitations

These findings are subject to various limitations. Firstly, no formal quality assessment of the included literature was undertaken as this is typically a requirement of systematic reviews rather than scoping reviews. Secondly, this scoping review was limited to the inclusion of literature and utility patents that were published in English. Online sports betting is prevalent across other jurisdictions in which English is not the primary language such as India, Taiwan, and Malawi (Bunn et al. 2020; Das 2021; Etuk et al. 2022; Hazarika and Ray 2023). Subsequently, relevant literature and utility patents from such jurisdictions may have been excluded during the search strategy.

Conclusions

Sports betting has transformed into a gambling mode that is more accessible, continuous, and provides more opportunity for bettor involvement. These structural characteristics may increase the outcome frequency of sports bets, extend sports betting sessions, and facilitate illusions of control. Furthermore, it is likely that the harms associated with the

digital transformation of sports betting will continue to emerge *via* innovative advancements if regulatory intervention is not appropriate or forward-looking. Researchers and policymakers should remain aware of these trends as they continue to emerge.

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